



Department of Energy
Washington, DC

FEB 1 2001

Ms. Yvonne Martin
U.S. Environmental Protection Agency
Region 4
Water Management Division
61 Forsyth Street, S.W.
Atlanta, Georgia 30303

Dear Ms. Martin:

On December 8, 2000, the U.S. Environmental Protection Agency (EPA), Region IV, issued a notice of availability of a *Revised, Proposed Total Maximum Daily Load (TMDL) for Waters and Pollutants of Concern in the State of Georgia*. The U.S. Department of Energy (DOE) has reviewed the revised *Total Maximum Daily Load (TMDL) Development for Total Mercury and Fish Consumption Guidelines* for eight segments of the middle and lower Savannah River watershed. Mercury in the environment is a concern because exposure to mercury can have potentially significant impacts on human health. DOE agrees that standards are necessary to protect public health and safety. However, the Department feels that these standards should be based on validated data, sound economic analysis, and assessments of expected benefits that supports EPA's decisions. We believe the standards should have a reasonable expectation of producing a measured improvement commensurate with the costs and are attainable with reasonable cost and existing technology.

With regard to the standard proposed, DOE is concerned with: 1) the assumption that reductions in anthropogenic aqueous mercury concentrations will produce beneficial reduction of mercury in fish without considering natural sources and the geochemical and biological cycling of mercury in the aquatic environment; 2) the lack of validated documentation and an adequate database to support EPA's conclusions; and 3) the need for cost benefit analysis to support the proposed mercury TMDL. Detailed comments related to these broad concerns are enclosed.

The Department appreciates EPA's consideration of these comments. The designated staff person regarding this subject is Lois Thompson. If there are questions regarding these comments, please contact Ms. Thompson at (202) 586-9581 or by e-mail at lois.thompson@eh.doe.gov.

Sincerely,

A handwritten signature in black ink, reading "Andy Lawrence".

Andy Lawrence
Director
Office of Environmental Policy and Guidance

Enclosure

**U.S. Department of Energy
Comments on the
Total Maximum Daily Load (TMDL) Development
For Total Mercury and Fish Consumption Guidelines
In the Middle and Lower Savannah River Watershed
(December 8, 2000)**

The U.S. Department of Energy (DOE) has completed a review of the proposed revised mercury TMDL. The broad concerns outlined in the cover letter, which include: 1) the assumption that reductions in anthropogenic aqueous mercury concentrations will produce beneficial reduction of mercury in fish without considering natural sources and the geochemical and biological cycling of mercury in the aquatic environment; 2) the lack of validated documentation and adequate database to support EPA's conclusions; and 3) the need for cost benefit analysis to support the proposed mercury TMDL, are based on our review and the detailed comments provided below.

Atmospheric Deposition versus Natural Sources

DOE urges EPA to conduct more research into the causes and solutions for waterbody impairments due to atmospheric deposition and investigate other sources of mercury such as “natural sources” found in the soil which may impact the mercury loading in the Savannah River. EPA is assuming that the waterborne total mercury comes primarily from atmospheric deposition. A transport model is applied to the watershed that incorporates atmospheric deposition and runoff/erosion to support the assumption that the source is atmospheric. Using the model, EPA calculates that about 59 kg/yr of mercury enters the Savannah River indirectly via atmospheric sources within the watershed of the middle and lower Savannah River. That loading is then multiplied by the ratio of the target mercury concentration (2.83 ng/L) to the observed mean aqueous mercury concentration (5.02 ng/L) to get the TMDL of 32.78 kg/y.

The assumption that 99% of the mercury loading to the Savannah River is derived from current atmospheric deposition is questionable. The calculated loading rate from the subwatersheds considered in the TMDL was 58.77 kg Hg/yr. Total wet and dry deposition to that subwatershed would have been 280 kg/yr at a deposition rate (wet plus dry) of 30 micro grams/m²/yr. Even at that very high assumed deposition rate, more than 20% of the mercury deposition would have to end up in surface flow to achieve such loading rates. Even in very rocky watersheds in Ontario and Quebec, mercury export to surface flow is less than 10% of wet and dry deposition. In watersheds with more developed soils, such as the Piedmont and coastal plains of the southeastern US, export would be even lower. Although some fraction of atmospherically derived mercury undoubtedly enters the surface flow in the Savannah River watershed, it is likely that erosion of geologically derived mercury associated with soil and sediment is also a major

component of the mercury flux in the river. If atmospheric mercury inputs could be reduced to zero, the mercury content of soil and sediment would not return to zero but would remain at a value consistent with the crustal abundance of mercury in rocks from which soils are derived. If the baseline concentration of mercury in natural clay soils is assumed to be 0.1 mg/kg, erosion of this material into a river where it was suspended at a concentration of 20 mg/L (probably not atypical of the lower Savannah River under baseflow conditions) would yield an aqueous total mercury concentration of 2 ng/L. It appears that the TMDL does not take into account this geologic mercury source, and assumes that a decrease in atmospheric loading would cause a proportionate decrease in mercury in surface water.

Models and Assumptions

DOE strongly believes that in the development of TMDLs EPA should use the best possible data and readily available predictive models on impaired waters. This part of the TMDL development process is critical. EPA has relied heavily on a number of models to predict conditions in a watershed of over 9 million square miles. While models in general are useful tools to help understand complex systems, and their predictive power is improving, the TMDL relies too heavily on the models and assumptions of their accuracy. In the several instances where EPA presents predicted results and actual measurements, there is general agreement between the values. However, there is little discussion of these comparisons in the report, and no estimates of how well the measured data fit the predicted curves. Because the models have the potential to introduce error into the final result, DOE recommends that the error (uncertainty) be reported and accounted for, as should the variabilities introduced throughout the modeling processing.

Site-Specific Criteria

As a basis for establishing the proposed standard, limited samples were collected over a few months time. The TMDL document also states that during this field effort, conditions were unusually dry. Yet these field data are used to represent conditions in the watershed. We have serious reservations with the establishment of criteria based upon one sampling event. The uptake of mercury by fish represents the summation of a multitude of pathways and components. In the case of the South Georgia TMDLs, these pathways are likely to include both benthic pathways and more planktonic type pathways. In all cases, there are multiple intermediate steps between the mercury concentrations in water and those in fish. The fluxes and transformations that occur in each of these steps are likely to be site-specific and seasonally variable. Thus, it is not clear that a generalized bioaccumulation factor as used in the proposed TMDL accurately reflects conditions when based on short-term measurements of concentrations in the two pools (water and fish). Methylation rates for mercury and bioaccumulation rates for fish vary seasonally and are dependent on other parameters such as water pH and organic content.

An example of the need for a site-specific watershed approach is in White Oak Creek in the state of Tennessee where Hg concentrations in water are typically in the range of 23 ng/L and above. However, the 1999 mean concentrations in fish tissue were 0.24 mg/kg in redbreast sunfish, and 0.21 mg/kg in largemouth bass in White Oak Lake. Based on this preliminary comparison, it appears that the water chemistry and bioaccumulation of Hg may be very different from one watershed to the next, and therefore water quality criteria development should be conducted on a site- or watershed-specific basis.

DOE feels it is imperative that regulatory decisions be based on an adequate database. No statistics to support uncertainty estimates are provided for any of the data used by EPA in establishing the TMDL. The Department strongly recommends that additional seasonal sampling be performed over several years during both low and high stream flow rates so that a valid target criterion for the presence of mercury in surface water can be established that is based upon adequate data. In the meantime, DOE recommends that NPDES permits be written based upon existing procedures and water quality standards and revised as these procedures and standards are updated through the appropriate regulatory processes.

Margin of Safety

EPA's margin of safety analysis selected the highest predicted water column concentration of Hg in the entire stretch of the river to determine the load reduction needed. EPA's data table in the proposed mercury TMDL shows extreme variability in water column Hg concentrations from one monitoring point to the next. While EPA's approach would provide a load-reduction requirement that would be protective of health, this approach is extremely conservative. The Department feels that other protective approaches should be considered to achieve health protection given the economic impacts, as discussed later, that would result from entities driving to meet the proposed reduction goal.

Water Quality Target

The method used to generate the Water Quality Target (WQT) is confusing and should be clarified. The fish criterion used by EPA in the Savannah River TMDL, from which a WQT (an aqueous limit for mercury analogous to the Ambient Water Quality Criteria) was generated, appears to be 0.4ppm mercury in fish. We derive the 0.4ppm level from our interpretation of the methodology and equation information shown on page 14 of the TMDL document, which uses the revised Hg RfD (0.0001mg/kg-d) and an ingestion rate of 17.5 g/d for a 70 kg adult. It appears that the 0.4 ppm fish criterion was converted to an aqueous concentration equivalent by dividing by the site-specific methylmercury bioaccumulation factor (4,000,000) and then again by the proportion of total aqueous mercury that was methylmercury (around 0.035), to yield a target concentration of 2.83 ng/L total mercury in water. However, the preceding page in the proposed TMDL

suggests that Georgia's fish consumption guideline of 0.23 mg/kg was used to generate the WQT. DOE recommends that this discrepancy be clarified, as it is fundamentally important in how the WQT is generated. Is the appropriate fish criterion in this case 0.23 mg/kg (Georgia's fish consumption advisory level), 0.3 mg/kg (EPA nationwide recommendation), or 0.4 mg/kg (apparently used in the TMDL)?

During its movement among the atmosphere, land, and water, mercury undergoes a series of complex chemical transformations. One of the products of these transformations is an organic form called methylmercury. Methylmercury is easily absorbed into the living tissue of aquatic organisms and is not easily eliminated. Therefore, it accumulates in predators. The degree to which mercury is transformed into methylmercury and transferred up the food chain through bioaccumulation depends on many site-specific factors (such as water chemistry and the complexity of the food web) through processes that are not completely understood. The proposed TMDL does not appear to account for these uncertainties in proposing a Water Quality Target of 2.83 ng/L. None of the data presented in the TMDL allows for the calculation of a WQT with that many significant figures. EPA's analysis and reporting produces results with a false sense of accuracy. In fact, the report notes that the "ultra-trace level techniques" used to measure parts per trillion quantities of mercury has a detection limit of 0.5 ng/L, one less significant figure than produced by the WQT calculation. The TMDL also lists levels of mercury in the Savannah River, and reports several values below the method detection limit. None of these are reported with accompanying statistics. DOE recommends that supporting statistical analysis accompany the proposed TMDL to help understand the reliability and uncertainty of the data.

Also, the usage of the term "target concentration" and WQT are confusing in the discussion. Are these two terms synonymous or different? We recommend that a statement be provided in the introduction and in the discussion of target identification clarifying these terms.

Anti-Degradation

Because of EPA's TMDL phased approach, it is possible that the WQT and the load allocation for mercury may be increased in the future. EPA states in the TMDL that it expects that air sources can be reduced by 40-50% by 2010. If this occurs, and EPA decides to revise the load allocation, point source dischargers would be unable to take advantage of a less restrictive TMDL because of State anti-degradation rules. EPA should provide for protection from anti-degradation rules, allowing point source dischargers to take advantage of TMDLs that will be later developed if it is determined to be protective to do so.

Costs of Compliance

The potential costs of attempting to comply with NPDES permits incorporating the proposed revised mercury TMDL is of concern to DOE. The Savannah River TMDL concludes that about 99% of Hg present in the surface water are the result of atmospheric deposition, with about 1% from water effluents, i.e., NPDES-permitted discharges. EPA estimated a total loading of 58.77 kg/year Hg into the river basin, and calculated that an annual loading of 32.78 kg would satisfy the water quality requirement (i.e., the TMDL would be 32.78 kg/year). Thus, a reduction of 25.99 kg Hg/year is needed. Given their relative contributions to the mercury present in surface waters, 32.45 kg/year reduction would need to be taken from atmospheric sources, and 0.33 kg/year from NPDES sources.

The Savannah River Basin includes dozens of NPDES permitted entities, each of which is theoretically capable of releasing measurable Hg in its effluent. The notion of stricter NPDES controls to measure and comply with very low Hg limits does not appear cost-effective, when, as noted above, there is no significant contribution to the reduction goal to be achieved from these sources. We also share EPA's concern stated in Section 10.2 of the TMDL, regarding potential for "significant social and economic disruption" if unattainable requirements are placed upon permit holders.

On August 18, 2000, a letter was submitted by the DOE Savannah River Site contractor to the Office of Management and Budget (OMB) in response to an Information Collection Request. In the letter, it was estimated that the capital costs for wastewater treatment needed for the Savannah River Site (SRS) to attempt to meet NPDES Permit limitations below twelve parts per trillion (12 ppt) could be as high as \$563,000,000 with annual operation and maintenance costs as high as \$34,000,000.

If all NPDES control efforts were successful, at tremendous costs for treatment system retrofits, new technology development, and ultra-clean sampling and analysis, the maximum benefit that could be realized would be a 1% reduction in the Hg entering the watershed. We would expect that these resources could be used more effectively if they were invested in pollution prevention activities that provide a more commensurate benefit.

New analytical methods will be required for NPDES dischargers across the nation to analyze water below the current routine detection limit of 50 ppm. Ultra-clean collection and analysis for trace levels of mercury would be more costly than current methods.

The TMDL proposes NPDES conditions for Hg dischargers already subject to water-quality based Hg limits, including a default effluent limit of 2.83 ng/L, unless permittees already had existing water quality-based Hg limits and would accept requirements for Hg-minimization plans and measures. Permittees who do have Hg limits would either receive the default limit, or implement Hg characterization and minimization programs, and agree to accept Hg limits in the future that would provide feasible/achievable

removals of Hg. The Department believes these proposed NPDES permit requirements may be unduly cumbersome and expensive. This would depend on the specific situation and the cost-benefit considerations associated with the amount of Hg load that could be reduced by a given facility's discharge. DOE requests that EPA do an economic analysis of this TMDL to determine cost versus benefit for the Savannah River Basin. Such an analysis could be used as a baseline for other areas around the country where TMDLs for mercury are being developed.